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Of A Specimen In Or On A Solid Support Member

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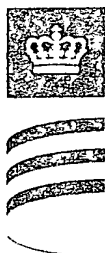
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**EN METODE TIL AT KONTROLLERE TEMPERATUREN AF EN PRØVE I  
ELLER PÅ EN FAST BÆRER**

A method of controlling the temperature of a specimen in or on a solid support member.

5 The present invention relates to a method of controlling the temperature of a preferably biological specimen in or on a solid support member, a solid support member, a solid support member in combination with an inductor and use of this solid support member, a solid support member in combination with an inductor.

10

Throughout the world, there is an increasing demand for examining or studying samples of different types, in particular biological samples such as tissue sections, cell smears, cytopspins, sections of cell blocks, molds, fungi, bacilli, fine needle aspirates and solutions containing macromolecules such as proteins, deoxyribonucleic acids and ribonucleic acids. Such samples or specimens are usually examined by placing the specimen in or on a solid carrier and subjecting the specimens to a number of treatments, where after the sample is examined using a microscope or other analytical instruments or apparatus able to detect and/or quantify the presence of particular components, e.g. specific cells, cell types, or cell components, and/or particular compounds, e.g. specific macromolecules like proteins, deoxyribonucleic acid and ribonucleic acid sequences, polysaccharides, etc., in the samples.

The solid supports generally used are microscope plates, microtiter plates or any other type of cartridges or test tubes. Normally, the specimen should remain on or in the support during the treatment procedure, and consequently it is important that the solid support is shaped in dependence of the type of treatment necessary for a specific test. Many assays involve a sequence of reaction steps which should be carried out under thermostatic conditions and/or reaction steps involving adding a reagent, allowing it to

react for a persecuted time, and drying of the specimen. In other situations an assay may involve a direct step of heat treatment.

5 Temperature regulations or control systems for cartridge or other solid supports are generally known in the art. In most of the systems the temperature is regulated using hot air, warm water or heat conducting elements which is brought into contact with the support member.

10 WO 92/01919 relates to an apparatus for automatic tissue staining for immunohistochemistry, said apparatus comprising a carousel carrying a number of microscope slides, each bearing a sample. The carousel is adapted to be heated, preferably from beneath, utilising hot air or  
15 warm water.

WO 97/03827 relates to an automated slide staining system for cytology or histology specimens, said system comprising a heating station provided by a convector, conducting heat  
20 to the slides. US Patent No. 5,232,667 describes a temperature control system using conductive heater means for heating samples in cartridges.

25 The above described temperature systems are generally very slow, meaning that it requires a relative long time to heat the specimens. Also the fact that all of the sample holders should be contacted with the conductive heater, the water or the hot air makes the systems very cumbersome. Furthermore, heating with air or water requires large  
30 space, and increase the risk of contaminating the specimen with dirt or unwanted microorganism.

WO 94/23326 relates to a microscope slide holder used for uniform processing of the slides. In this patent  
35 publication, it is suggested that the heating step is carried out in a suitable oven. This method also requires

large space, and since the heat treatment often is carried out several times during an assay, this method is not suitable in most assays. Heating an oven also requires a lot of energy, which is both expensive and unnecessary if only a few samples should be subjected to the heat treatment.

It has also been suggested to control the temperature of specimens in or on a solid support by using infrared radiation or microwave.

US patent No. 5,023,187 relates to a device for accelerated treatment of thin tissue specimens on microscope slides. The microscope slides are placed in a slide holder, and energy is supplied to the surface of the slides in the form of infrared radiation.

US patent No. 5, 244,787 relates to a method for retrieval of antigens from formalin-fixes, paraffin-embedded tissues and their subsequent staining by immunohistochemical techniques comprising a step of immersing the tissue sections in water and heating the water using microwave.

Working with infrared radiation and microwave requires special equipment, since exposing to infrared radiation and microwave is injurious to health, and consequently, infrared radiation and microwave treatment should be avoided if possible.

The object of the present invention is to provide a method of controlling the temperature of a specimen, in particular a biological specimen, which method does not suffer from the drawbacks mentioned above.

A further object is to provide a method of controlling the temperature of a specimen, including a biological specimen,

which method provides a fast regulation of heat, is simple and precise, and also at the same time, which is not hazardous to health.

- 5 This and other objects are provided with the method according to claim 1.

According to the method of the invention, the specimen to be subjected to a heat control or heat treatment is placed  
10 in or on a solid support member. The solid support member is either totally or partially prepared from an electrically conducting material, or the solid support member is equipped with an electrically conducting material by bringing one or more pieces of electrically  
15 conducting material into physical contact with the specimen or the solid support member.

The electrically conducting material may, as indicated, be in direct contact with the specimen. However, in most  
20 situations, it is preferred that the electrically conducting material and the specimen are not in physical contact. It is preferred that a layer of heat conducting material is placed between the electrically conducting material and the specimen, so that the electrically  
25 conducting material is in contact with the layer of heat conducting material which heat conducting material is in direct contact with the specimen. The distance between the electrically conducting material and the specimen should, however be sufficiently short to allow a fast  
30 heating of the specimen. The more heat conducting material there is between the electrically conducting material and the specimen, the longer it takes for the generated heat to be transmitted to the specimen.

- 35 The solid support member is subjected to a oscillating magnetic field, whereby the electrically conducting

Generally, it is preferred that the solid support member is adapted for carrying small samples e.g. solid specimen having a size less than 3 cm<sup>3</sup>, preferably less than 0.1 cm<sup>3</sup> and liquid specimen (including soluted or dispersed specimen) having a volume less than 10 ml, preferably less than 1 ml.

Solid support member of the above type but without electrically conducting material, are well known in the art. The type of solid support member is selected in dependence of the type of specimen and of the type of heat control and treatment the specimen should be subjected to.

Solid support members as described in the prior art publications US patent No. 5,068,091, US patent No. 5,338,358, WO publication 94/18539, WO application No. PCT/DK98/00580, WO publication No. 92/01919, WO publication No. 97/03827, US Patent No. 5,232,667, US patent No. 5, 244,787, US patent No. 5,023,187 are in general useful in the present method, when these support members are modified by equipping the support member with an electrically conducting material.

When the specimen is in a liquid form e.g. a liquid specimen, a solid specimen or a dispersed or soluted specimen, the solid support member may be a microtiter plate, a test tube or a similar member comprising a well.

Any type of test tube or any type of microtiter plate comprising at least two wells may be used.

A well in a test tube or a microtiter plate may have any shape. Normally, a well is shaped as a hollow well formed by a circumferential wall having a concave or plane bottom. The well of the test tube or one of the wells of

the microtiter plate comprise a conducting material. The conducting material may be in the form of a solid piece of electrically conducting material placed in the well or in the form of one or more solid pieces or particles of  
5 conducting material incorporated in the wall or the bottom of the well. The electrically conducting material may also be loosely placed in the well, e.g. in the form of bead shaped pieces including electrically conducting material.

10

If the solid support member is a microtiter plate, the microtiter plate should preferably comprise at least 5 wells and preferably at least 10 wells. All or at least a number of the wells, e.g. every second or third of the  
15 wells, may preferably be equipped with electrically conducting materials. The amount and type of electrically conducting materials in each well, or incorporated in the wall or the bottom of each well may vary from each other. These embodiments are particularly  
20 preferred when the electrically conducting material are loosely placed in the wells. By using different amounts of electrically conducting material the temperature obtained in each well may vary, when subjecting the microtiter plate to an oscillating magnetic field.

25

When the solid support member is a test tube, it is most preferred that the electrically conducting material are fixated on the inner side of the wall or loosely placed in the well in form of beads, powder or sticks.

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When the specimen is in a solid, semi-solid or high-viscous liquid form, the solid support member may preferably be a cartridge, a microscope slide or a combination thereof.

35

A useful cartridge may comprise at least one chamber encompassed by a cartridge wall, and one or more pieces of electrically conducting materials. In the heat control step, the specimen is placed in the chamber either  
5 directly or on a secondary carrier e.g. a microscope slide, and the cartridge is subjected to a magnetic field. The chamber should preferably comprise at least one access opening for introducing the specimen, and for passing a processing fluid into and out of the chamber.  
10 The conducting material may e.g. be in the form of a solid piece of conducting material placed on the inner side of the cartridge wall, or in the form of one or more solid pieces or particles of conducting material incorporated in the wall of said cartridge.  
15 A useful cartridge may e.g. be selected between the cartridge described in US patent No. 5,068,091, US patent No. 5,338,358, WO 94/18539 or WO application No. PCT/DK98/00580 modified by incorporating an electrically  
20 conducting material. These cartridges are all adapted to be used in combination with either one or several microscope slides, on which slide or slides the specimen or specimens are placed. The slide or slides are inserted into the cartridge. In an alternative, however not  
25 preferred embodiment, the cartridge is adapted to receive the specimen directly i.e. the specimen is placed directly in the cartridge without the use of a secondary carrier.  
30 As indicated above, it is preferred that the support member is a cartridge in combination with at least one microscope slide, and more preferred a cartridge in combination with one microscope slide. The cartridge comprises preferably a chamber for each slide it is  
35 adapted to be combined with, and at least one access opening for introducing and withdrawing of each of these

slides. Furthermore, the cartridge comprises at least one opening for passing a processing fluid into and out of the chamber or chambers. The electrically conducting material may be placed on or incorporated into the microscope slide and/or on or incorporated into the cartridge. The electrically conducting material may e.g. be in the form of a solid piece of conducting material placed on the inner side of the cartridge wall or on the microscope slide, or in the form of one or more solid pieces or particles of conducting material incorporated in the wall of the cartridge and/or the microscope slide.

A particular preferred cartridge in combination with one or more microscope slides, is a cartridge in combination with a microscope slide, where the cartridge comprises a housing having a cavity therein and an aperture providing access for the introduction of the microscope slide into the cavity, so as to divide it in two compartments when the microscope slide is inserted therein. One of the compartments (called the first one) is defined by the sample bearing surface of the slide, an inner surface of the cavity and spacing means there between of such size, form and configuration, that the dimension of the first compartment perpendicular to the sample bearing surface of the support member and the inner surface of the cavity is of capillary dimensions. The other compartment (called the second compartment) is defined by opposite surface(s) to the sample bearing surface of the slide and the remaining inner surface(s) of the cavity. The cavity is provided with elastically means engaging said support member and biasing the sample bearing surface of the support member against said spacing means in the first compartment. This cartridge is described in further details in WO application No. PCT/DK98/00580.

In another embodiment, the solid support member is constituted by a microscope slide alone or a microscope in combination with a cover plate.

- 5 When the solid support member is constituted by a microscope slide alone, the electrically conducting material is preferably placed in the form of one or more solid pieces placed on the back side (the side opposite the side adapted to bear the specimen) or the slide or on  
10 the front side on the area surrounding the center part of the front side, where the center part is the area adapted to be in direct contact with the specimen. The center part, normally constitutes a circular area with a diameter between  $\frac{1}{2}$ -2cm, and placed central on the slide.  
15 The electrically conducting material may also be incorporated in the slide material in the form of small pieces, beads or powder. When the solid support member is constituted by a microscope slide alone, the slide may be handled together with other similar slides in a holder as  
20 e.g. described in US patent No. 4,199,613.

- When the solid support member is constituted by a microscope slide in combination with a cover plate, the electrically conducting material may be placed on or  
25 incorporated into the slide and/or the cover plate. The slide may be as the slide described above adapted to be used alone or the slide may be a simple slide of glass, polymer or other non-conducting materials. The cover plate may be a second microscope slide which likewise,  
30 may be as the slide described above. Such sets of slides, but without electrically conducting materials, are described in US 4,731,335, and the sets of slides in modified form (equipped with electrically conducting materials) as well as the slide holder may be used in the  
35 method of the present invention.

Alternatively, the cover plate may have any other shape provided that it comprises a surface adapted to cover a specimen on the surface of the microscope slide. A useful combination of microscope slide and cover plate which  
5 naturally should be modified (equipped with electrically conducting materials) is e.g. described in WO 96/21142.

In all the above embodiments, including a microscope slide, it is preferred that the slide is a transparent  
10 slide, at least on the central part of the slide. Ordinary microscope slides of glass may preferably be used.

The electrically conducting material may be any type of  
15 material which is able to generate heat when subjected to an oscillating magnetic field. Preferred electrically conducting materials are non magnetic metals, more preferably a metal selected between carbon steel, stainless steel, brass, copper, aluminium, silver, gold,  
20 platinum, nickel, zinc, pewter or alloys thereof.

The electrically conducting material should preferably have a large surface, relative to the amount of electrically conducting material in order to provide a  
25 fast heat regulation, including allowing a fast cooling of the specimen. When the electrically conducting material is in the form of one or more pieces, this or these one or more pieces may be in the form of one or more plates, having a length, a width and a thickness  
30 wherein the length and the width, respectively, being at least 10 times the thickness.

The amount of electrically conducting material in a solid support depends on the type and size of the support as  
35 well as the type and size of specimen(s) and the choice of electrically conducting materials. In most situations,

the solid support member preferably comprises between 10 and 100.000 mg of a conducting material. A skilled person may determine the optimal amount, by carrying out a few tests.

5

When the electrically conducting material is in the form of powder incorporated into the material constituting the whole or a part of the solid support member, this  
10 material wherein the powder is incorporated, is preferably a polymer material e.g. a mentioned later on.

The amount of electrically conducting material should be sufficiently high to raise the temperature of the  
15 specimen when the solid support is subjected to the oscillating magnetic field.

When the electrically conducting material is in the form one or more metal containing beads, the beads should  
20 preferably have an average size of between 1-1.000.000 nm, preferably 25-10.000 nm.

When the specimen is in the form of a liquid specimen or a dispersed or soluted specimen, said bead or beads are  
25 preferably placed in direct contact with said specimen, however care should be taken that the electrically conducting material does not contaminate or react with the specimen. The specimen may be fixated directly onto such beads. When the specimen have been treated with a  
30 liquid, the liquid may be seperated from the beads carrying the specimen by capturing the beads with a magnet.

The solid support member for testing or treating  
35 specimens of biological material is preferably at least partly of a glass material or a polymer material, and

comprises an electrically conducting material. At least a part of the glass material or the polymer material in direct contact with the specimen is preferably transparent in order to make the specimen easy visible.

5

If the support member is at least partly of a polymer material, this polymer material may in general be any type of polymer that does not result in an unwanted interference with the specimen. The polymer material may preferably be selected from synthetic and natural polymers such as polystyrene, polyethylene, polyurethane, polyethylene teraphthlates, polyvinylacetate, polyvinyl-chloride, polyvinyl-pyrrolidone, polyacrylonitrile, poly-methyl-methacrylate, polytetrafluoro-ethylene, poly-carbonate, poly-4-methyl-pentylene, polyester, poly-styrene polypropylene, cellulose, nitro-cellulose, starch, polysaccharides, natural rubber, butyl rubber, styrene butadiene rubber, silicone rubber and copolymers or mixtures thereof.

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It is preferred that the magnetic field is generated by use of an electromagnetic inductor comprising an induction coil in the form of a wire wound into a coil with one or more windings, and a power supply sending alternating current through the coil. Such electromagnetic inductors are generally known to a skilled person. The electromagnetic inductor may have any shape, provided that it is able to generate an oscillating magnetic field, and that the solid support member can be placed in this oscillating magnetic field. The inductor may comprise a movable shelf surrounded by the coil, and on which shelf the solid support member or members may be placed. The movable shelf in the oscillating magnetic field may, when it is moved during the induction heating step, result in a more evenly

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distribution of the heat effect of the specimen(s) in the solid support member(s) placed on the shelf.

The power supply may be an A.C. power supply, the  
5 frequency range is between 50 Hz-500 kHz, preferably up to 200 kHz, and the power delivered through said coil is up to about 100 W, preferably between 25 and 75 W. If many specimens are to be heat controlled at the same time, the power delivered through said coil may be  
10 higher, e.g. up to about 1000 W, low frequency A.C. current between 50 and 100 Hz are very adequate in the present method.

In the method according to the invention, it is preferred  
15 that the specimen is a biological specimen. However, the method may in general be used for any type of biological, chemical and physical tests on organic and inorganic materials, preferably on organic materials.

20 The method is particular useful for testing or treating vegetable or animal specimens, preferably human specimens e.g. cellular specimens of skin, bones, blood or muscles.

Any type of test procedures including a heat control  
25 step, may be carried out using the claimed method. Examples of test procedures are described. Solid support members as described in the prior art publications US patent No. 5,068,091, US patent No. 5,338,358, WO publication 94/18539, WO application No. PCT/DK98/00580,  
30 WO publication No. 92/01919, WO publication No. 97/03827, US patent No. 5,232,667, US patent No. 5, 244,787 and US patent No. 5,023,187. Preferred procedures are immunohistochemical or/and situ hybridisation.

35 In the method according to the invention, the step of heat control includes heating the specimen to a

temperature of between 25 and 110 °C, preferably between 30 and 95 °C, more preferably between 35 and 85 °C.

5 In another preferred embodiment, the specimen is heated and maintained at a constant temperature for a period of 1 minute and up to 1 week, preferably for up to 1 hour. The specimen may e.g. be incubated at 35 °C for 24 hours using this method.

10 The step of a procedure including heat control, may also be drying, and/or fixation at elevated temperature (e.g. a temperature above 30 °C) or subjecting the specimen to a reaction step at elevated temperature (e.g. a temperature above 30 °C). The step of reaction may e.g. 15 comprise baking the specimen (e.g. fixation of tissue onto a slide), exposing the specimen to antigen retrieval, denaturing the specimen, hybridising the specimen, dewaxing (deparafinating) the specimen and washing the specimen.

20 In a variation of the method according to the invention, a solid support is constituted by a chip with a gold film onto which gold, a capture probe or similar is fixated as it is known from the surface plasmon resonance (SPR) 25 system. The specimen is a biological specimen in liquid or solitude or dispersed form which flows through a channel and contacting the side of the gold film carrying the capture probe. Light (e.g. polarised light) is directed at, and reflected from, the side of the gold 30 surface not in contact with the specimen, and SPR causes a reduction in the reflected light intensity at a specific combination of angle and wavelength. Biomolecular binding events cause changes in the refractive index at the surface layer, which are detected 35 as changes in the SPR signal. In general, the refractive index changes for a given change of mass concentration at

the surface layer, is practically the same for all proteins and peptides, and is similar for glycoproteins, lipids and nucleic acids. The method according to the invention, includes combining the SPR technique with a  
5 step of heating the gold film by subjecting the chip to an oscillating magnetic field, e.g. by placing the chip in an induction coil and applying a power to the coil. By heating the gold film slightly above the temperature of the specimen, it is possible to conduct a very effective  
10 stringent washing. The SPT technique is generally known to a skilled person. Equipment for carrying out SPR analysis is marketed by BiaCore AB under the trade names BIAlite® and BIAcore® as well as by Fisson Ltd under the trade name IASys® and ASI AG under the trade name BIOS-  
15 1®, and a similar type of product namely, cavity-coupled refractive index sensor (CRIS) is marketed by RISØ and Torsana Diagnostics.

The present invention also relates to the solid support  
20 member as well as the use of said solid support member as described in further details above.

Fig. 1 shows a cartridge with a microscope slide,  
25 respectively, in cross-section and seen from above surrounded by an electromagnetic induction coil. The cartridge comprises a cavity, wherein the slide is introduced through access opening A. A metal film is fixated in the sealing of the cavity in. When an  
30 oscillating magnetic field is created, the metal film will generate heat and the heat will be directly conducted to the specimen.

Fig. 2 shows a microscope slide 2a in combination with a  
35 cover plate 2b. The microscope slide is an ordinary glass slide or a similar non electrically conducting slide

carrying a specimen on its upper surface. The cover plate is prepared from a electrically conducting metal. The microscope slide and the cover plates are sandwiched with the specimen in between. An electromagnetic induction coil is placed sufficiently close to the cover plates to be able to provide an oscillating magnetic field in the cover plate, which plate there generates heat, and the specimen is heated to a preselected temperature.

Fig. 3 shows a microtiter plate in cross-section and a part of a microtiter plate seen from above. The microtiter plate seen in cross-section comprises 7 wells 3d, each containing a specimen 3a. The microtiter plate comprises a wall material 3a surrounding all of the wells, and a bottom material including an electrically conducting metal 3c. The microtiter plate seen from above is in principle constructed as the microtiter plate seen in cross-section. When the microtiter plate is subjected to an oscillating magnetic field, heat is generated in the metal 3c, and the specimen is heated to a preselected temperature.

Fig. 4 shows a test tube seen in cross-section. The test tube has one well comprising a reaction medium. A probe comprising an electrically conducting material is inserted to the reaction medium. A specimen is fixated to the probe. An electromagnetic induction coil is surrounding the test tube. When an oscillating magnetic field is created, the electrically conducting metal generates heat and the heat will be directly conducted to the specimen.

Fig. 5 shows another test tube seen in cross-section. The test tube has one well comprising a liquid specimen. A number of particles containing an electrically conducting metal is dispersed in the specimen. An electromagnetic

induction coil is surrounding the test tube. When an oscillating magnetic field is created, the electrically conducting metal generates heat and the heat will be directly conducted to the specimen.

5

#### Eksamples:

Example 1. A cartridge containing a carbon-steel film with a thickness of 0.05 mm as described above in fig. 1 is filled with 500 $\mu$  L water in the center of the cartridge. The cartridge is placed on a induction coil capable of delivering a maximum of 600W. Since the cartridge covered only 1/20 of the coil, the energy delivered to the cartridge is expected to be below 30W. The initial temperature of the water sample in the cartridge was measured to 22°C. The induction generator was turned on and the temperature followed. After 60 seconds, the temperature reached 72°C.

Example 2. A cartridge with a 0.25 mm thick carbon-steel film attached as in fig. 1, is inserted into a surrounding induction coil. The sample is heated with the induction coil to 80°C in 20 sec and kept at this temperature using a temperatur feedback device for 5 min. The heating is then discontinued. And the sample allowed to cool down to room temperature.

Example 3. Specimen was added to each well of a microtiter plate according to fig. 2 and heated to 85°C for 10 min by induction and controled by a temperature control device.

Example 4. Magnetic particles of 3  $\mu$ m containing a capture probe are placed in a tube and incubated with a mixture of a complementary oligonucleotide labelled with FITC and a mismached oligonucleotide labelled with

rhodamine. The particles are locally heated by applying an inductive field. Then the particles are fixed in the tube by a magnet while the remaining components are poured out and washing buffer added. The particles are  
5 thoroughly mixed into the washing buffer and stringent washed by applying a new round of induction field. The resulting particles are analysed by flow cytometry and florescence microscopy and it is verified that there is a clear discrimination between the complementary and the  
10 mismatched oligo target.

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- 5 1. A method for controlling the temperature of a specimen  
in or on a solid support member by using induction  
heating, said solid support member comprising a  
conducting material, and said method comprising a step of  
10 subjecting said solid support to an oscillating magnetic  
field.
2. A method according to claim 1, wherein the support  
member is a microtiter plate, a cartridge, a microscope  
slide, a cartridge containing a microscope slide, a test  
15 tube, a probe, a particle, a membrane, or a filter.
3. A method according to claims 1 or , wherein said solid  
support member is a microtiter plate comprising at least  
two wells, and said specimen is a liquid specimen, a  
20 solid specimen or a dispersed or soluted specimen.
4. A method according to claim 3, wherein said wells each  
comprise a bottom and a wall, and at least one of said  
wells comprise a conducting material, said conducting  
25 material preferably being in the form of a solid piece of  
conducting material placed in said at least one well or  
in the form of one or more solid pieces or particles of  
conducting material incorporated in the wall or the  
bottom of said at least one well.
- 30
5. A method according to claims 1 or 2, wherein said  
solid support member is a cartridge comprising a chamber  
encompassed by a cartridge wall, said specimen being  
placed in said chamber when said chamber is subjected to  
35 a magnetic field, said chamber comprising at least one  
access opening for introducing the specimen, and for

passing a processing fluid into and out of the chamber, said conducting material preferably being in the form of a solid piece of conducting material placed on the inner side of said cartridge wall, or in the form of one or  
5 more solid pieces or particles of conducting material incorporated in the wall of said cartridge.

6. A method according to claims 1 or 2, wherein said solid support member is a microscope slide comprising an  
10 electrically conducting material, said slide preferably being a least partly transparent.

7. A method according to claims 1 or 2, wherein said solid support member is a microscope slide in combination  
15 with a cover plate comprising an electric conducting material, said specimen being placed between said cover plate and said slide when subjecting said solid support to a oscillating magnetic field, said slide preferably being a transparent plate.

20 8. A method according to claims 1 or 2, wherein said solid support member is a cartridge containing a microscope slide, said cartridge comprising a chamber, and at least one access opening for introducing and  
25 withdrawing of said slide, and at least one opening for passing a processing fluid into and out of the chamber, said microscope slide is placed in said chamber, and bears said specimen, said conducting material preferably being in the form of a solid piece of conducting material  
30 placed on the inner side of said cartridge wall, or in the form of one or more solid pieces or particles of conducting material incorporated in the wall of said cartridge.

35 9. A method according to claims 1 or 2, wherein said solid support member is a test tube, said test tube

comprising a well having a bottom and a wall, said well comprises a conducting material, fixated on the wall, incorporated in the wall or bottom material or loosely placed in the well.

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10. A method according to anyone of the preceding claims, wherein the support member comprises an electrically conducting material, said electrically conducting material preferably being in direct contact with the specimen or in contact with a layer of heat conducting material, which heat conducting material being in direct contact with the specimen.

15 11. A method according to anyone of the preceding claims, wherein the electrically conducting material is a metal, preferably a non magnetic metal, more preferably a metal selected between carbon steel, stainless steel, brass, copper, aluminium, silver, gold, platinum, nickel, zinc,  
20 pewter or alloys thereof.

12. A method according to anyone of the preceding claims, wherein the conducting material is in the form of one or more plates, having a length a width and a thickness,  
25 said length and said width being at least 10 times the thickness.

13. A method according to anyone of the preceding claims 1-11, wherein the electrically conducting material is in  
30 the form of powder incorporated in a polymer material, the amount of powder being sufficiently high to raise the temperature of the specimen when the solid support is subjected to the oscillating magnetic field.

35 14. A method according to anyone of the preceding claims 1-11, wherein the electrically conducting material is in

the form one or more metal containing beads, preferably having an average size of between 1-1.000.000 nm, preferably 25-10.000 nm.

- 5 15. A method according to claim 14, wherein said specimen is in the form of a solid specimen, and said specimen being fixated directly on said bead or beads.
- 10 16. A method according to anyone of the preceding claims, wherein said solid support comprises an amount of electrically conducting material sufficiently high to raise the temperature of the specimen when the solid support is subjected to the oscillating magnetic field.
- 15 17. A method according to anyone of the preceding claims, wherein said magnetic field is generated by use of an electromagnetic inductor comprising an induction coil and a power supply, and sending alternating current through said coil.
- 20 18. A method according to claim 17, wherein said power supply is an AC power supply, the frequency range is between 1 Hz-500 kHz, preferably between up to 200 kHz, more preferably between 50-100 HZ.
- 25 19. A method according to claim 18, wherein power delivered through said coil is up to about 100 W.
- 30 20. A method according to anyone of the preceding claims, wherein said specimen being a biological specimen.
- 35 21. A method according to anyone of the preceding claims, comprising a step of heating the specimen to a temperature of between 25 and 110 °C, preferably between 30 and 95 °C, more preferably between 35 and 85 °C.

22. A method according to claim 21, wherein the specimen is heated and maintained at a constant temperature for a period of 1 minute and up to 1 week, preferably for up to 1 hour.

5

23. A method according to claim 21, wherein the specimen is dried and/or fixated at elevated temperature, preferably a temperature above 30 °C.

10 24. A method according to claim 21, wherein the specimen is subjected to a reaction step at elevated temperature, preferably a temperature above 30 °C, said reaction step comprises baking the specimen, exposing the specimen to antigen retrieval, denaturing the specimen,  
15 hybridising the specimen, devaxing the specimen and washing the specimen.

25. A solid support member for testing or treating specimens, preferably a specimen of biological material,  
20 said support member preferably being at least partly of a glass material or a polymer material, and said solid support member comprises an electrically conducting material.

25 26. A support member according to claim 25, said support member being at least partly of a polymer material selected from synthetic and natural polymers such as, polystyrene, polyethylene, polyurethane, polyethylene teraphthlates, polyvinylacetate, polyvinylchloride,  
30 polyvinyl-pyrrolidone, polyacrylonitrile, polymethylmethacrylate, polytetrafluoroethylene, polycarbonate, poly-4-methyl-pentylene, polyester, polystyrene polypropylene, cellulose, nitro-cellulose, starch, polysaccharides, natural rubber, butyl rubber, styrene  
35 butadiene rubber, silicone rubber and copolymers or mixtures thereof.

27. A support member according to claim 26, wherein electrically conducting material is incorporated into the polymer material.

5

28. A support member according to claim 27, wherein the electrically conducting material is in the form of powder incorporated in the polymer material, the amount of powder and the particle size of the powder being  
10 sufficiently high to provide the material with electrically conducting properties.

29. A support member according to anyone of the preceding claims 25-28, wherein the electrically conducting  
15 material is a metal preferably a non magnetic metal, more preferably a metal selected between carbon steel, stainless steel, brass, copper, aluminium, silver, gold, platinum, nickel, zinc, pewter or alloys thereof.

20 30. A support member according to anyone of the preceding claims 25-27 and 29, wherein the electrically conducting material is in the form of one or more plates, having a length a width and a thickness, said length and said width being at least 10 times the thickness.

25

31. A support member according to anyone of the preceding claims 25-27 and 29, wherein the electrically conducting material is in the form one or more metal beads, preferably having an average size of between 1-1.000.000  
30 nm, preferably 25-10.000 nm.

32. A support member according to anyone of the preceding claims 25-31, wherein said solid support comprises between 10 and 100.000 mg of a conducting material.

35

33. A support member according to anyone of the preceding claims 25-33, wherein the support member is a microtiter plate, a cartridge, a microscope slide, a cartridge containing a microscope slide, a test tube, a probe, a particle, a membrane, or a filter.

34. A support member according to claim 33, wherein said solid support member being a microtiter plate comprising at least two wells, and said specimen is a liquid specimen, a solid specimen or a dispersed or soluted specimen.

35. A support member according to claim 34, wherein said wells each comprise a bottom and a wall, and at least one of said wells comprises a conducting material, said conducting material preferably being in the form of a solid piece of conducting material placed in said at least one well or in the form of one or more solid pieces or particles of conducting material incorporated in the wall or the bottom of said at least one well.

36. A support member according to claim 33, wherein said solid support member is a cartridge comprising a chamber, for receiving a specimen, and at least one access opening for introducing the specimen, and for passing a processing fluid into and out of the chamber, said conducting material preferably being in the form of a solid piece of conducting material placed on the inner side of said cartridge wall, or in the form of one or more solid pieces or particles of conducting material incorporated in the wall of said cartridge.

37. A support member according to claim 33, wherein said solid support member is a microscope slide comprising an electric conducting material, said slide preferably being a least partly transparent.

38. A support member according to claim 37 wherein said electrically conducting material preferably covering up to about 50 % of one of the sides of the slide, preferably the non-specimen bearing side of the slide.

39. A method according to claims 33, wherein said solid support member is a cartridge containing a microscope slide, said cartridge comprising a chamber for receiving said microscope slide, and at least one access opening for introducing and withdrawing of said slide, and at least one opening for passing a processing fluid into and out of the chamber, said conducting material preferably being in the form of a solid piece of conducting material placed on the inner side of said cartridge wall, or in the form of one or more solid pieces or particles of conducting material incorporated in the wall of said cartridge.

40. A support member according to claim 33, wherein said solid support member is a test tube, said test tube comprising a well having a bottom and a wall, said well comprises a conducting material, fixated on the wall, incorporated in the wall or bottom material or loosely placed in the well.

41. A solid support member in combination with an electromagnetic inductor said support member being a support member according to anyone of the claims 25-40 and said electromagnetic inductor being able to generate a magnetic field.

42. A support member in combination with an inductor according to claim 41, wherein said inductor comprises an induction coil and a power supply, said coil, preferably being sufficiently large to surround the support member,

and said power supply being able to sending alternating current through said coil.

43. A support member in combination with an inductor  
5 according to claim 42, wherein said power supply is an AC power supply, the frequency range is between 1 Hz-500 kHz, preferably between up to 200 kHz, more preferably between 50-100 HZ.

10 44. Use of a support member in combination with an inductor according to anyone of the claims 41-43 for treatment of a specimen, preferably an biological specimen, more preferably a vegetable or an animal specimen, even more preferably cellular specimens of  
15 bones, blood or muscles.

45. Use of a support member according to claim 44 for immunohistochemical procedures or in situ hybridisation.

20

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FIG 1

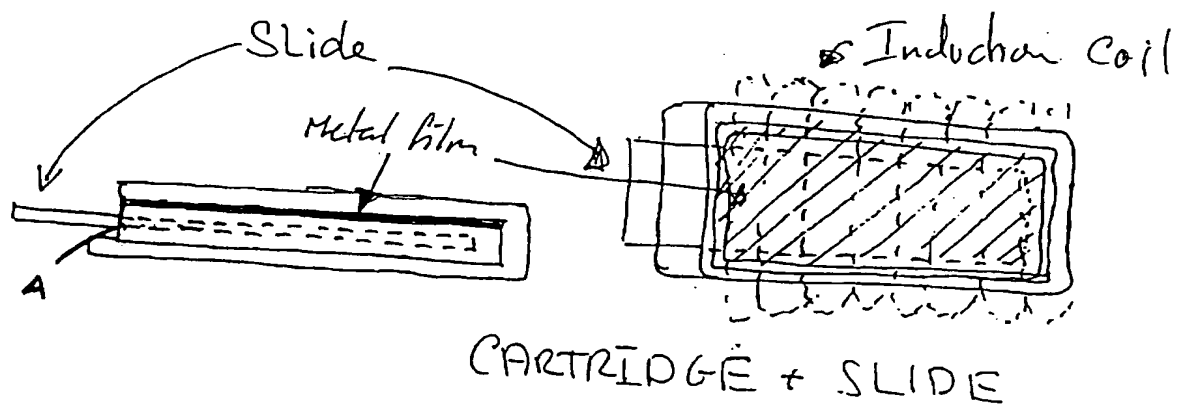


FIG 2

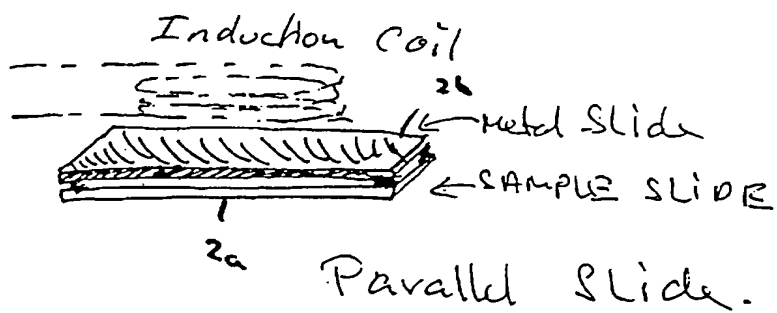


FIG 3

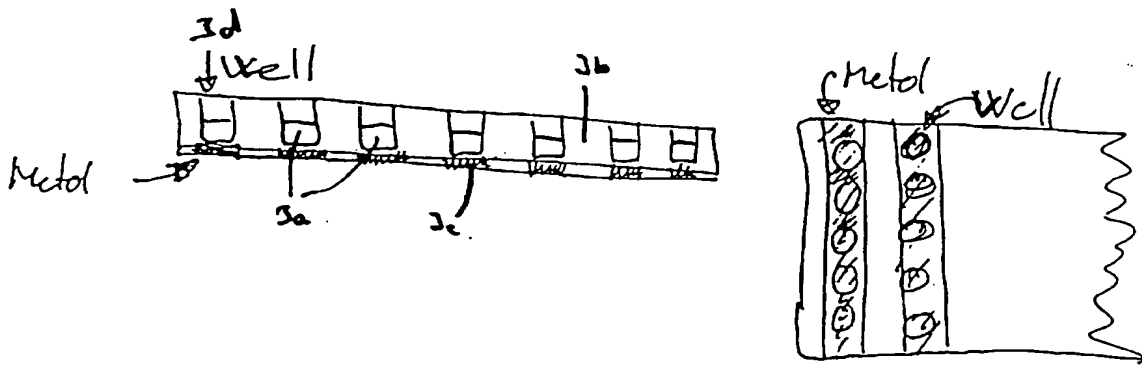
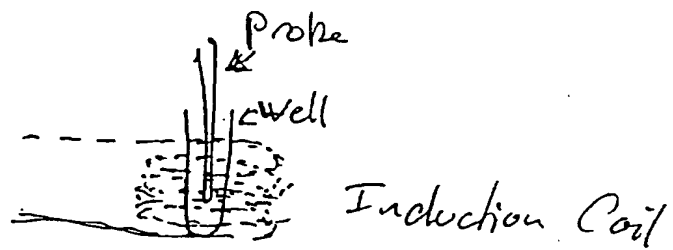


FIG 4



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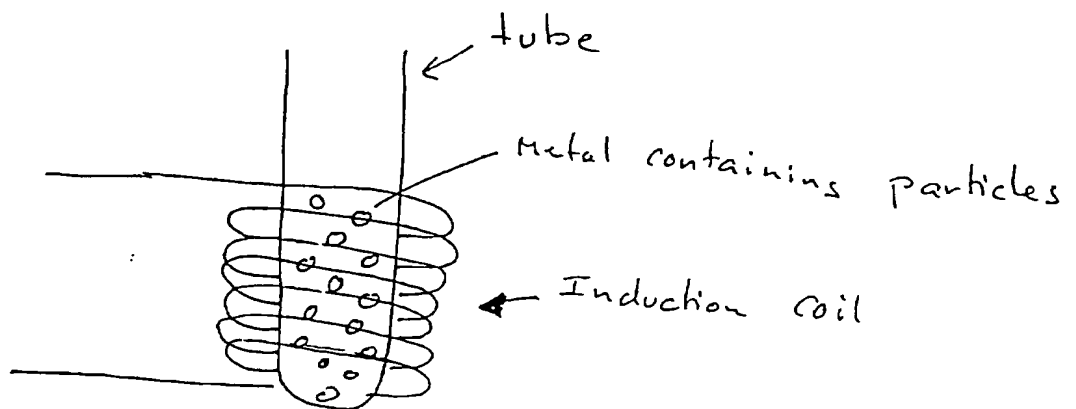


FIG 5